

VISIONS: THE ART OF SCIENCE

Orchestration at the beginning: mitosis in sea urchin embryo[†]

Running title: Cell division in sea urchin blastula

GISELLE A. ABRUZZESE^{1#*}, NAE TANPRADIT^{1,#*}, RENATA S. TAVARES^{1#*} 

¹ Frontiers in Reproduction Course, Marine Biological Laboratories, University of Chicago, Woods Hole, MA

***Corresponding authors:**

E-Mail: giselleabruzzo@gmail.com; tanpradit.n@gmail.com;
renata.tavares@cnc.uc.pt

[#]These authors contributed equally to this work and should be considered joint first authors.

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Development of multicellular organisms is driven by a series of mitotic divisions after fertilization. Total cytoplasmic volume does not increase during this process, resulting in an increasing number of smaller daughter cells. Cell divisions are initially synchronous in an early embryo, but this ends at the 16-cell stage in the sea urchin. Orchestrated mitosis does, however, continue in subpopulations via the coordination of two different processes: karyokinesis and cytokinesis. Part of this asynchrony is due to the differentiation of lineages.

Sea urchin (*Lytechinus variegatus*) gametes are readily obtained, and microinjection of their oocytes and eggs is easy (Carroll et al 1999, *Dev Biol* 206:232-247). Furthermore, the eggs and embryos are clear, allowing for the microscopic visualization of their rapid development, from the cleavage stages through blastula and eventually to larvae. An example of the orchestrated mitosis among a specific lineage of cells is observed in this *Lytechinus variegatus* blastula cultured with the nucleotide Alexa Fluor 488 deoxyuridine triphosphate (dUTP), which labels the chromosomes (Terasaki and Jaffe, 2004, *Methods Cell Biol*, 74:469-489). This single embryo was imaged over several mitotic divisions using an inverted point scanning confocal microscope (Zeiss Axio observer.Z1), and the optical sections were displayed as a time-lapse reconstruction (moving clockwise from the top with 2 min intervals). We speculate that an excess of dye is being expelled by the cells, resulting in the staining observed in the periphery of the embryo. This article is protected by copyright. All rights reserved

Keywords: cell division; mitosis; embryo development; *Lytechinus variegatus*

Footnotes

Current affiliations:

GA Abruzzese • - CEFYBO-CONICET-UBA, Buenos Aires, Argentina

N Tanpradit • Chulalongkorn University, Bangkok, Thailand

RS Tavares • University of Coimbra, Coimbra, Portugal

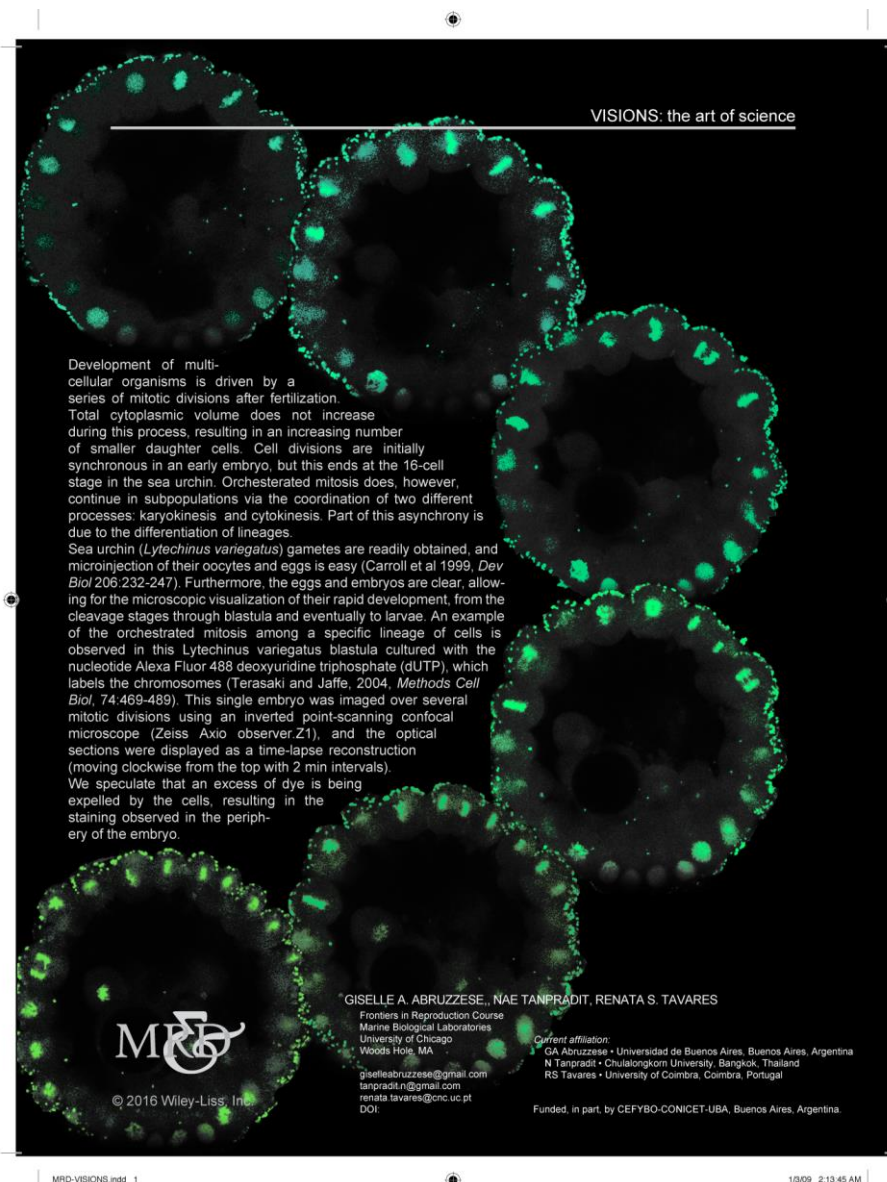


Figure 2